

# LFE DELAY LINES

*from 5 nanoseconds to 2 seconds*

LFE offers to the designer of guidance systems, computers, MTI Radar, ECM Systems, and other applications a wealth of technical know-how dating back to 1947 — which now makes possible the most accurate, reliable and advanced custom engineered Delay Lines for laboratory and operational use.

Delay Lines from LFE Advanced Components are ideally suited to both military and commercial applications, and where severe environmental conditions prevail.

Application of the latest technological advances and manufacturing techniques insures high reliability and stability at low cost and in the minimum of space.



For your complete Delay Line needs, LFE Advanced Components provides:

## MAGNETOSTRICTIVE DELAY LINES

Torsional and longitudinal — Fixed, adjustable and variable — Delays from 2 Microseconds to 10 Milliseconds — RZ Bit rates up to 4 Megacycles — Complete RZ and NRZ memories incorporating electronics.

## PRECISION RANGE MARKERS

Single and double ended — Pulse spacing 1.0 to 100 Microseconds — Center frequencies up to 500 Megacycles.

## DIGITAL ULTRASONIC DELAY LINES

Fixed, tapped, adjustable and multiple channel — Delays from 0.5 to 1,000 Microseconds — Bit rates (RZ) up to 50 Megacycles — Complete RZ or NRZ serial memory systems incorporating electronics.

## SOLID ULTRASONIC DELAY LINES

Fixed, tapped and variable — Fused quartz or zero temperature coefficient glass delay media — Quartz or ceramic transducers — Delays from 0.3 Microseconds to 10 Milliseconds — Center frequencies from 1 to 100 Megacycles — Matched delay line sets — Delay line packages incorporating drivers, amplifiers, detectors and temperature control circuits.

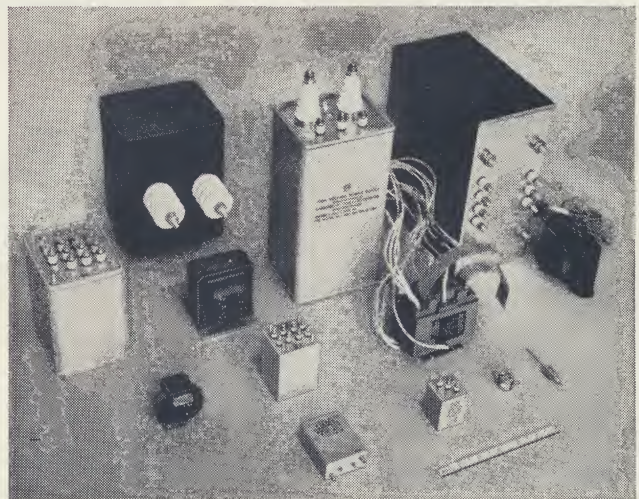
## ELECTROMAGNETIC DELAY LINES

Lumped - and distributed - constant — Fixed, tapped, variable and modular — Hermetically sealed or encapsulated — Time delays ranging from 5 Nanoseconds to 2 Seconds — Impedance from 10 ohms to 10,000 ohms — Delay to rise time ratio up to 200 to 1.

# TRANSFORMERS

Complete production facilities are available for environmental testing of components to military specifications. Advanced Components transformers include: Pulse — Audio — Power — Reactors — High Q and RF Coils — Electric Wave Filters — Magnetic Amplifiers and power supply specialties.

LFE Advanced Components offers technical assistance and engineering advice and service in determining your exact delay line and transformer requirements in the most economical way.



**ADVANCED COMPONENTS**

# LFE ELECTRONICS

DELAY LINES • FILTERS • TRANSFORMERS AND ASSOCIATED  
ELECTRONICS • ROTARY MEMORY DEVICES

A DIVISION OF LABORATORY FOR ELECTRONICS, INC.  
1075 COMMONWEALTH AVENUE • BOSTON 15, MASS.

## SPECIFICATIONS

### TAPPED ULTRASONIC DELAY LINE

|                                  |                                           |
|----------------------------------|-------------------------------------------|
| Number of Taps                   | 13                                        |
| Delay Increment                  | 0.500 $\mu$ sec                           |
| Delay Range                      | 0.500 to 6.500 $\mu$ sec                  |
| Delay Tolerance                  | $\pm$ 10 nsec                             |
| Center Frequency                 | 30 Mc                                     |
| Bandwidth                        | 10 Mc                                     |
| Attenuation                      | 45 db $\pm$ 1 db into 75 ohms             |
| Spurious Signals                 | 35 db (minimum) below main signal         |
| Operating Temperature Range      | -55 to +125 °C                            |
| Temperature Coefficient of Delay | 2 ppm/°C over operating temperature range |
| Size                             | 6" Diameter $\times$ 1" High              |
| Connectors                       | BNC                                       |

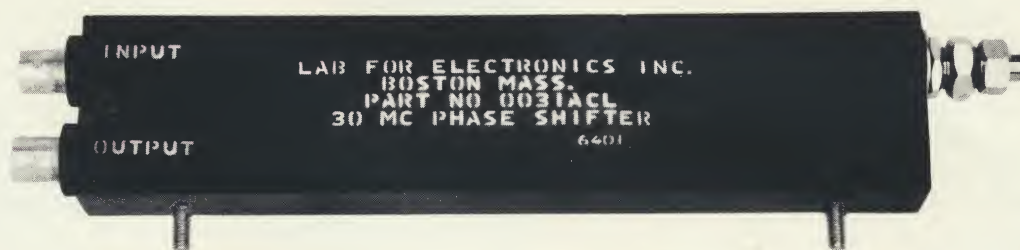
Mechanical Configuration and electrical characteristics may be changed to suit specific requirements.

### VARIABLE PHASE SHIFTER

|                             |                                                        |
|-----------------------------|--------------------------------------------------------|
| Phase Shift Range           | 5° to 365° typ.                                        |
| Frequency                   | 10 to 100 Megacycles (depends on specific application) |
| Impedance                   | 25 to 1000 ohms (depends on specific application)      |
| Resolution                  | 1°                                                     |
| Operating Temperature Range | -20 to +85°C                                           |
| Size                        | 7" L $\times$ 1-3/4" H $\times$ 3/4" Thk               |
| Connectors                  | BNC                                                    |

Electrical and mechanical characteristics may be changed to suit specific requirements.





Tapped Ultrasonic Delay Line With Compatible Variable Phase Shifter



advanced  
components

**LFE ELECTRONICS**

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